

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE																														
PRESSURE BOOT ASSEMBLY, ITEM 104 (1) LEFT (1) RIGHT ----- 0104-210895- 25/26/29/30; 0104-210895- 33/34/35/36 (2)	2/1R	104FM32  Loss of primary axial restraint webbing.  Defective Material: Worn thread or webbing.	END ITEM: Loss of primary axial restraint.  GFE INTERFACE: Axial load will be transferred to secondary restraint webbing.  MISSION: Terminate EVA.  CREW/VEHICLE: Loss of boot sole and ability to interface with foot restraint. Loss of crewman with loss of secondary restraint webbing.  TIME TO EFFECT /ACTIONS: Minutes.	A. Design - The inside and outside boot primary restraints are fabricated from 1" wide polyester webbing. Size "F" and "E" polyester thread conforming to V-T-2850 type II, Class I is used to fabricate the primary restraints with type 301 lock stitching conforming to FED-STD-751A. Seams are terminated by back tack and searing of thread ends. Inside and outside axial restraints pulled to destruction exhibited an ultimate strength of 1918 lbs, demonstrating a safety factor of 2.29 against S/AD limit load of 838 at 4.4 psid.  At 5.5 psid the inside and outside axial restraints exhibit safety factors of 4.3 and 4.9 respectively. AT 8.8 psid the inside and outside axial restraints exhibit safety factors of 9.2 each.  Worn thread is precluded by the abrasion protection afforded to the boot axial restraint by the TMG. Webbing wear is further precluded by applying epoxy adhesive to the exposed threads of the keeper screw to eliminate sharp edges.  B. Test - Acceptance: The boot primary and secondary axial restraints are subjected to the S/AD limit loads of 400 pounds on the inner side restraint and 350 pounds on the outside restraint during manufacture.  PDA: The following test is conducted at the Lower Torso Assembly level in accordance with ILC Document 0111-710112. A proof pressure test at 8.0 + 0.2 - 0.0 psig for a minimum of 5 minutes is conducted with the TMG removed.  Certification: The Enhanced Boot axial restraints were successfully tested (manned) during certification to duplicate operational life (Ref. ILC Document 0111-711330).  The following usage, reflecting requirements of significance to the boot restraints, was documented during certification:																														
				<table border="1"> <thead> <tr> <th>Primaries Requirement</th> <th>S/AD</th> <th>Actual</th> </tr> <tr> <th>-----</th> <th>----</th> <th>-----</th> </tr> </thead> <tbody> <tr> <td>Ankle Flexion/Extension</td> <td>11614</td> <td>24000</td> </tr> <tr> <td>Pressure Cycles</td> <td>300</td> <td>600</td> </tr> <tr> <td>Don/Doff Cycles</td> <td>98</td> <td>400</td> </tr> <tr> <td>Pressure Hours</td> <td>458</td> <td>916</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Per EM # 93-1131: Secondaries Requirement</th> <th>S/AD</th> <th>Actual</th> </tr> <tr> <th>-----</th> <th>----</th> <th>-----</th> </tr> </thead> <tbody> <tr> <td>Ankle Cycles</td> <td>5807</td> <td>12000</td> </tr> <tr> <td>Pressure Cycles</td> <td>150</td> <td>300</td> </tr> </tbody> </table>	Primaries Requirement	S/AD	Actual	-----	----	-----	Ankle Flexion/Extension	11614	24000	Pressure Cycles	300	600	Don/Doff Cycles	98	400	Pressure Hours	458	916	Per EM # 93-1131: Secondaries Requirement	S/AD	Actual	-----	----	-----	Ankle Cycles	5807	12000	Pressure Cycles	150	300
Primaries Requirement	S/AD	Actual																																
-----	----	-----																																
Ankle Flexion/Extension	11614	24000																																
Pressure Cycles	300	600																																
Don/Doff Cycles	98	400																																
Pressure Hours	458	916																																
Per EM # 93-1131: Secondaries Requirement	S/AD	Actual																																
-----	----	-----																																
Ankle Cycles	5807	12000																																
Pressure Cycles	150	300																																
				The Enhanced Boot axial restraints were successfully subjected to a BTA ultimate pressure of 13.2 psig (1.5 times max BTA operating pressure based on 8.8 psid)																														

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		104FM32		<p>(Ref. ILC Document 0111-711330).</p> <p>C. Inspection - Components and material manufactured to ILC requirements at an approved supplier are documented from procurement through shipping by the supplier. ILC incoming receiving inspection verifies that the materials received are as identified in the procurement documents, that no damage has occurred during shipment and that supplier certifications have been received which provide traceability information.</p> <p>The following MIP'S are performed during the Boot Assembly manufacturing process to assure that the failure causes are precluded from the fabricated item.</p> <ol style="list-style-type: none"><li>1. Restraint webbings are inspected for damage after load test to 400 lbs. during manufacturing.</li></ol> <p>During PDA, the following inspection points are performed at the boot assembly level in accordance with ILC Document 0111-710112:</p> <ol style="list-style-type: none"><li>1. Visual inspection for material degradation.</li><li>2. Visual inspection for structural damage following proof pressure test.</li></ol> <p>D. Failure History - None.</p> <p>E. Ground Turnaround - Every four years or 229 hours of manned pressurized time the boots are removed from the LTA and subjected to internal and external visual inspection with TMGs removed for structural integrity and material degradation or damage. Following installation to the LTA, structural and leakage tests are performed.</p> <p>F. Operational Use - Crew Response - Pre/post-EVA : When detected terminate EVA prep. If detected audibly or tactily, troubleshoot problem. If no success, use spare LTA if available or terminate EVA prep. EVA : When detected terminate EVA. Special Training - No training specifically covers this failure mode. Operational Considerations - Not applicable.</p>

EXTRAVEHICULAR MOBILITY UNIT  
SYSTEMS SAFETY REVIEW PANEL REVIEW  
FOR THE  
I-104 LOWER TORSO ASSEMBLY (LTA)  
CRITICAL ITEM LIST (CIL)

EMU CONTRACT NO. NAS 9-97150

Prepared by: *[Signature]* 3/27/02  
HS - Project Engineering

Approved by: *[Signature]* 12/26/02  
NASA - SSA/SSM

*M. Snyder*  
HS - Reliability

*[Signature]* 5/17/02  
NASA - EV/ISSM

*Alan Plough for RCM*  
HS - Engineering Manager

*[Signature]* 5/17/02  
NASA - S&ML

*Alan Th. Schubert* 5/23/02  
NASA - MOD

*Joe Tamm* 6/04/02  
NASA - C/OW

*[Signature]* 6/13/02  
NASA - Program Manager